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⑭ シリンジ

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明 細 書

1. 発明の名称

シ リ ン ジ

2. 特許請求の範囲

シリンジ部とピストンからなるシリンジにおいて、前記シリンジ部を、ガラス筒からなるシリンジ本体と、このシリンジ本体の先端開口部を略閉塞するように設けられ且つシリンジ本体の内外部に連通して貫通孔が形成されたキャップと、このキャップの前記貫通孔に一端を挿通しシリンジ本体内外間の吸入吐出路を形成するパイプと、このパイプの中間部に固着されて膨出部を形成する環状部材と、互いに嵌合する一対の部材からなり前記シリンジ本体、キャップ環状部材およびパイプの一端部からなる部分を収容して環状部材の一端面とシリンジ本体の基端面間を前記嵌合により押圧し該部分を保持するとともにシリンジ本体の基端側にピストンの軸部の挿通を許容する孔部並びにパイプの他端

を外部に突出させるための孔部を有し且つ前記シリンジ本体内部を通視し得る通視窓を有するホルダと、このホルダ、前記シリンジ本体、キャップおよび前記環状部材の相互の圧接個所のいずれかに介挿されあるいは前記キャップおよび環状部材のいずれかを構成し各部相互間の密封に寄与するとともに各部の体積変化を吸収する弾性体とを用いて構成したシリンジ。

3. 発明の詳細な説明

本発明は、薬液、体液等の注入抽出、搬送等に使用されるシリンジの改良に関するものである。

一般に、シリンジすなわちいわゆる注射器は、薬液等の収納室を形成し且つ先端に吸入・吐出口を有するシリンジ部と、このシリンジ部内に挿入され吸入・吐出操作を行なうためのピストンとで構成されている。

従来、この種のシリンジはシリンジ部がガラスによる一体成型または合成樹脂による一体成型により形成されていた。このため、シリンジ

部をガラス製としたものは内容積の高精度化が容易ではなくしかも破損し易いという問題があり、シリンド部を合成樹脂製としたものはやはり内容積の高精度化が容易ではなくまた耐薬品性、耐久性にも問題があった。しかも、合成樹脂製の場合、内部の汚れ等が落ちにくいという問題もある。

特に、この種のシリンジは、自動生化学分析装置等において、薬液、試料液等の搬送、分注用のポンプとして使用されることがある。この場合には、分析等において高精度の測定データを維持するために液体を極めて高精度に吸入・吐出せねばならない。しかしながら、このような場合、冷蔵されていた液体や加熱された液体を頻りに吸入・吐出するので温度変化による熱収縮、熱膨張を繰り返すことになり、そのため前記温度変化により気密性が劣化し吸入・吐出の精度が低下するおそれがある。これは、測定データへの直接的な影響となつてあらわれる。また、このような場合シリンド部を固定して用

いるが、その固定に際し強度、構成等の点で接着を併用しなければならないことが多いが、この接着が前述の熱収縮、熱膨張のためはがれ、位置ずれ等を生じて吸入・吐出精度が低下することもある。

本発明は、このような事情に基づいてなされたもので、温度変化に起因する精度低下がなく、しかも容易に破損することもないシリンド部としたシリンジを提供することを目的としている。

すなわち、本発明の特徴は、シリンド部を、ガラス筒からなるシリンド本体と、このシリンド本体の先端開口部を略閉塞するように設けられ且つシリンド本体の内外部に連通して貫通孔が形成されたキャップと、このキャップの前記貫通孔に一端を挿通しシリンド本体内外間の吸入吐出路を形成するパイプと、このパイプの中間部に固着されて膨出部を形成する環状部材と、互いに組合する一対の部材からなり前記シリンド本体、キャップ、環状部材およびパイプの一端部からなる部分を収容して環状部材の一端面

とシリンド本体の基端面間を前記組合による押圧し該部分を保持するとともにシリンド本体の基端側にピストンの軸部の挿通を許容する孔部並びにパイプの他端を外部に突出させるための孔部を有し且つ前記シリンド本体内部を透視し得る透視窓を有するホルダと、このホルダ、前記シリンド本体、キャップおよび前記環状部材の相互の圧接個所のいずれかに介挿されるいはキャップおよび環状部材のいずれかを構成し各部相互間の密封に寄与するとともに各部の体積変化を吸収する弾性体とを用いて構成することにある。

以下、図面を参照して本発明の実施例を説明する。

第1図は、本発明の一実施例の構成を示す縦断面図である。同図において、シリンド本体11はガラスからなる筒体であり、所定の内径を有するガラス筒を所定の長さ寸法に切断したものである。このシリンド本体11の基端には、例えばポリ四ふつ化エチレン等からなる環状の

パッキング12が設けられている。また、シリンド本体11の先端にはキャップ13が設けられている。このキャップ13は例えばポリ四ふつ化エチレン等からなり、この場合中心軸に沿って貫通孔を有し、外周にシリンド本体11内部に嵌挿される小径部とそれより充分に大なる直径を有する大径部が形成されて略フランジ状をなしている。また、前記貫通孔の先端面(大径側端面)の開口縁部には適宜なる大きさの面取りが施こされている。前記シリンド本体11の端面と前記キャップ13の設置部との間にはOリング14が設けられている。また、前記キャップ13の貫通孔に一端部を嵌挿し、他端部を先端側に突出して例えばステンレス等からなるパイプ15が設けられている。このパイプ15の中間部外周にはステンレス等からなり例えば略算盤珠のような形状の環状部材16が銀ろう付け、レーザ溶接等の手段により固着されて膨出部を形成している。これら、シリンド本体11、パッキング12、キャップ13、Oリ

ング14、パイプ18および環状部材16は、パイプ15の前記他端部を外部に突出させた状態で例えばステンレス製のホルダ17に収容保持される。このホルダ17は基端側を保持する第1の部材17aとこの第1の部材17aに螺着され先端側を保持する第2の部材17bとで構成されている。第1の部材17aは、この場合略直方体のブロック状をなし、これには、基端側に前記パッキング13の縁部を係止する小径部、この小径部の先端側にパッキング13を収容し且つレリング本体11の挿入を許容する大径部、そしてさらに先端側に前記大径部より充分に大なる内径を有するめねじ部がそれぞれ形成された貫通孔が設けられている。また、この第1の部材17aの前記貫通孔の側方には取付孔17fが適宜設けられている。第2の部材17bは、この場合前記キャップ13を収容し且つレリング本体11の挿入を許容する内径を有する略平底筒状をなし、これには、先端側側底部に前記パイプ15を挿通し且つ前記環状部

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材16を係止するための孔部17gが形成され、該孔部17gの内側（基端側）縁部には適宜な大きさの面取りが施こされている。この第2の部材17bの基端開口部の周囲には前記第1の部材17aのめねじ部に螺合するおねじ部が形成されている。また、第2の部材17bの中間部周壁には内部を透視するための透視窓17hが形成されている。このホルダ17は、前述の各部を内部に収め、第1の部材17aに第2の部材17bを螺合させ、締めつけることによつて、第1の部材17aの貫通孔における小径部と第2の部材17bの孔部17gの縁部との間で前記各部を軸方向に押圧挟持する。このようにして、レリング部8を構成する。

以上のような構成とすれば、レリング部8内部は、レリング本体11の先端部にキャップ13が、キャップ13の貫通孔にパイプ16がそれぞれ嵌挿されて略密封されるばかりでなく、レリング本体11の先端－Ｏリング14－キャップ13－環状部材16－第2の部材17bの

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る。

さらに、上述の場合高い強度を得るため並びに製造上の便宜を考慮して、ホルダ17を金属製としたが、透視窓17hを設けているので、レリング部8の内部を目視できる。また、この場合ホルダ17に直接取付孔を設けて取付固定するようにしているため、確實で且つ安定な取付けが可能であり、しかも固定時にレリング本体11に曲げ応力が加わるおそれがない。

その上、ホルダ17の締付を適宜調整すれば、流体使用圧力範囲、温度変化範囲等に応じた圧接力の調整が行なえ、気密性を最良の状態とすることができる。

なお、本発明は、上述し且つ図面に示す実施例にのみ限定されることなく、その要旨を変更しない範囲内で種々変形して実施することができる。

例えば、上記実施例では、キャップ13を4ぶつ化エチレン樹脂等により形成しこれとＯリング14によりレリング本体11の先端部を密

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封し且つＯリング１４の弾性により温度による体積変化を吸収させるようにしたが、第３図に示すようにキャップ１３をふつ葉ゴム、エキレンゴム等の弾性体で構成し、これによりＯリング１４を用いることなくシリリング本体１１の先端部の密封および体積変化の吸収を行なわせるようにしてもよく、また、環状部材１６を上と同様あるいはウレタンゴム等の弾性体で構成し同様の効果を得るようにしてもよい。

また、Ｏリング１４を設ける場合、Ｏリング１４の介挿箇所は第４図に示す１４(Ⅱ)、１４(Ⅲ)、１４(Ⅳ)のいずれの他所でも良く、また複数箇所としてもよい。

さらに、第５図に示すようにホルダ１７の第１の部材１７ｂの環状部材１６に対する当接面に弾性体シート１８を敷設（弾性材によるコーティングを施こしてもよい）してＯリング１４の代りにすることもできる。

また、第６図に示すように貫通孔を有する球状の環状部材１５としてもよい。

以上、詳述したように本発明によれば、シリリング部に温度変化に起因する精度低下がなく、しかも容易に破損することもなく、又各部品の劣化時には該当部品の交換も容易に行なえるシリリングを提供することができる。

４ 図面の簡単な説明

第１図および第２図はそれぞれ本発明の一実施例の構成を示す縦断面図および斜視図、第３図～第６図は本発明のそれぞれ異なる他の実施例を説明するための要部断面図である。

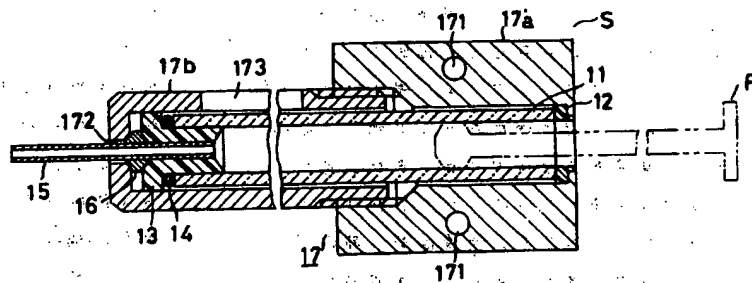
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- １２…パッキング
- １３…キャップ
- １４…Ｏリング
- １５…パイプ
- １６、１９…環状部材
- １７…ホルダ
- １７ａ…第１の部材
- １７ｂ…第２の部材
- １７ｃ…取付孔

１１

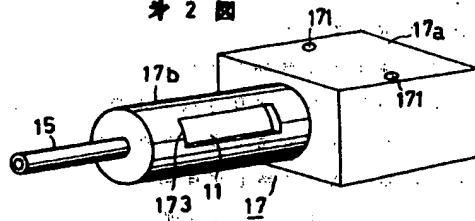
１２

- １７ｃ…孔部
- １７ｄ…通視窓
- １８…弾性体シート

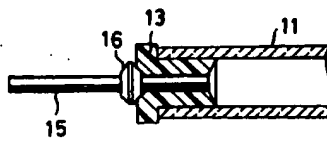
第１図



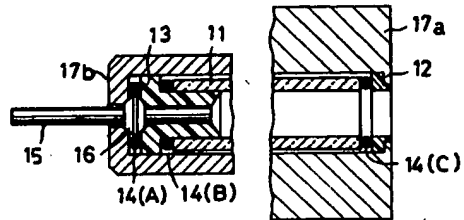
第２図



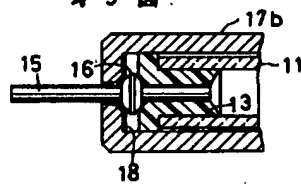
第 3 圖



第 4 圖



第 5 圖



第 6 圖



PTO 02-3819

Japanese Kokai Patent Application
No. Sho 55[1980]-73352

SYRINGE

Kiyoshi Yamashita

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. JULY 2002
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SYRINGE

[Shirinji]

Inventor:	Kiyoshi Yamashita
Applicant:	Tokyo Shibaura Denki KK

[There are no amendments to this patent.]

Claim

A syringe constituted such that, in a syringe composed of a cylinder part and a piston part, the aforementioned cylinder part includes: a cylinder main body composed of a glass tube, a cap that is furnished to nearly plug the opening at the end of the cylinder main body and in which a through-hole is formed connecting the inside and the outside of the cylinder main body, a pipe that is inserted through one end into the aforementioned through-hole in the cap and that forms a suction and discharge path between the inside and outside of the cylinder main body, an annular

member that is affixed in the middle part of the pipe and that forms a protruding part, and a pair of members that are screwed together; the portion composed of the aforementioned cylinder main body, the cap annular member, and one end of the pipe is housed inside; one end surface of the annular member and the base surface of the cylinder main body are pressed by the aforementioned screwing together and said portion is maintained in place; there is also a hole that permits the shaft of the piston to pass through and a hole for letting the other end of the pipe protrude outside the base end of the cylinder main body; and it uses a holder that has a see-through window that makes it possible to see inside the aforementioned cylinder main body, and an elastic body that is inserted anywhere that the holder, the aforementioned cylinder main body, the cap, and the aforementioned annular member are pressed together or that also constitutes either the aforementioned cap or the annular member and contributes to sealing between each of those parts, and that absorbs changes in volume of each part.

Detailed explanation of the invention

This invention pertains to an improvement to a syringe that is used for injecting, extracting and transporting medicines, body fluids, etc.

A syringe, that is, a so-called hypodermic syringe, is generally constituted with a cylinder part that forms a storage chamber for medicines, etc. and has a suction and discharge opening at the tip, and a piston that is inserted into the cylinder part for suction and discharge operations.

In the past the cylinder part for this type of syringe would have been formed with one-piece molding of glass or one-piece molding of synthetic resin. Because of this, when the cylinder part is made of glass, it is not easy to provide high precision for the internal volume and it is also readily breakable, which are disadvantages. When the cylinder part is made of synthetic resin, it has not been easy to provide high precision for the internal volume, and chemical resistance and durability have also been problems. Additionally, with synthetic resin, there is also the problem that external staining does not come off easily.

In particular, these types of syringes are sometimes used in automatic biological analyzers for transporting medicines and sample liquids, and as enzyme pumps. In this case, the liquid must be suctioned in and discharged with extremely high precision in order to maintain high precision measurement data for analysis, etc. However, in such a case, cooled liquid or heated liquids are frequently sucked in and discharged, so there will be repeated thermal contraction and thermal expansion caused by the temperature changes. Because of this, the airtightness will be degraded by the aforementioned temperature changes, and there is the danger that the accuracy of suctioning and discharge will drop. This will appear as a direct effect on the measurement data. The cylinder part is fixed and used in such cases, and adhesion must also be used for fixing from the standpoint of strength, construction, etc. The adhesive may separate due

to the abovementioned thermal contraction and thermal expansion, and misalignment may occur so that suctioning and discharge accuracy also drop.

The present invention was devised on the basis of such a situation. Its purpose is to provide a syringe that uses a cylinder part that has not had drop in precision caused by temperature changes and that in addition will not break easily.

In short, the distinctive features of this invention are that it is constituted so that the cylinder part is composed of a cylinder main body composed of a glass tube, a cap that is furnished to nearly plug the opening at the end of the cylinder main body and in which a through-hole is formed connecting the inside and the outside of the cylinder main body, a pipe that is inserted through one end into the aforementioned through-hole in the cap and that forms a suction and discharge path between the inside and outside of the cylinder main body, an annular member that is affixed in the middle part of the pipe and that forms a protruding part, and a pair of members that are screwed together. The portion composed of the aforementioned cylinder main body, the cap, the annular member, and one end of the pipe is housed inside, between one end surface of the annular member and the base end surface of the cylinder main body is pressed by the aforementioned screwing together and said portion is held. There is also a hole that permits the shaft part of the part of the piston to pass through and a hole for letting the other end of the pipe protrude outside the base end of the cylinder main body. It uses a holder that has a see-through window that makes it possible to see inside the aforementioned cylinder main body, and an elastic body that is inserted anywhere that the holder, the aforementioned cylinder main body, the cap, and the aforementioned annular member are pressed together or that also constitutes either the aforementioned cap or the annular member and contributes to sealing between each of those parts, and that absorbs changes in volume of each part.

Application examples of this invention are explained below by referring to the figures.

Figure 1 is a longitudinal cross section showing the constitution of one application example of this invention. In the figure, cylinder main body (11) is a tubular body made of glass and is made by cutting a glass tube with a specific internal diameter to a specific length. Annular packing (12) made of polyethylene tetrafluoride, for example, is furnished in the base end of cylinder main body (11). Cap (13) is also furnished at the tip of cylinder main body (11). Cap (13) is made of polyethylene tetrafluoride, for example. In this case it has a through-hole along its center axis, and a small diameter part that fits inside cylinder main body (11) and a large diameter part that has a diameter sufficiently larger than that are formed around the outside to give it nearly a flange shape. Chamfering of a sufficient size is applied to the edge of the opening at the forward end surface (large diameter end surface) of the aforementioned through-hole. O-ring (14) is provided between the end surface of aforementioned cylinder main body (11) and the stepped part of aforementioned cap (13). Pipe (15), made of stainless steel, for example, is

also furnished with one end inserted into the through-hole in cap (13) and the other end projecting toward the tip. Annular member (16), with a shape such as an abacus bead and composed of stainless steel or the like, is affixed around the outside in the center part of pipe (15) by some means such as silver soldering, laser welding, or the like, forming a swollen section. Cylinder main body (11), packing (12), cap (13), O-ring (14), pipe (15) and annular member (16) are housed and held in holder (17), made of stainless steel, for example, with the aforementioned other end of pipe (15) protruding outside. Holder (17) is constituted by first member (17a) that holds the base end and by second member (17b) that is screwed onto first member (17a) and holds the tip. First member (17a) forms a nearly rectangular parallelepiped shaped block in this case, and in it is furnished a through-hole in which are formed a small diameter part that fastens the edge of aforementioned packing (12) to the base end, a large diameter part that houses packing (12) at the tip of the small diameter part and that allows cylinder main body (11) to be inserted, and in addition, a female thread part that has an internal diameter that is sufficiently larger than the aforementioned large diameter part at the tip. Mounting holes (171) are also furnished as appropriate at the sides of the aforementioned through-hole in first member (17a). Second member (17b) houses aforementioned cap (13) in this case and forms a tubular shape with a bottom that has an internal diameter that permits the insertion of cylinder main body (11). A hole (172), into which aforementioned pipe (15) is inserted and for fastening aforementioned annular member (16), is formed at side bottom part at the tip. Chamfering of a sufficient size is applied to the inside (base end) of said hole (172). A male thread part that screws into the female thread part of aforementioned first member (17a) is formed around the periphery of the opening at the base end of second member (17b). See-through window (173) for seeing the inside is also formed in the peripheral wall in the middle part of second member (17b). Holder (17) has each of the abovementioned parts inside, and by screwing second member (17b) into first member (17a) and tightening them, each of the aforementioned parts is pressed axially and held between the small diameter part in the through-hole in first member (17a) and the edge of hole part (172) in second member (17b). Cylinder part (S) is constituted in this way.

With a constitution such as above, not only is the inside of cylinder part (S) sealed by cap (13) fitting through the tip of cylinder main body (11) and pipe (15) fitting through the through-hole in cap (13), but the tip of cylinder main body (11), O-ring (14), cap (13), annular member (16), and the edge of hole part (172) in second member (17b) are pressed together so that it is completely sealed. [The area] between the base end of cylinder main body (11) and first member (17a) is also sealed by packing (12). The aforementioned pressing together is accomplished using the elasticity of O-ring (14) and can be adjusted by how tightly holder (17) is screwed together. Additionally, in this case, changes in the internal volume of the cylinder

caused by thermal expansion or thermal contraction of the parts due to temperature changes can be absorbed by the elasticity of O-ring (14) and internal seal can be maintained. So the accuracy of suctioning and discharge can be kept high. No adhesion or the like is used for joining the parts and a seal is maintained by pressing together, so there will be no drop in the degree of sealing caused by adhesion separation or the like. When any of the components breaks or its characteristics deteriorate, the relevant portions can be replaced easily, and maintenance will be simple.

Also, cylinder main body (11) uses a glass tube with a simple shape, so it can be produced easily and inexpensively so that the inner peripheral shape and the inner diameter are very precise. It will also be possible to manufacture it even more inexpensively and easily by cutting glass tubes that are standard products to the prescribed dimensions and using them.

In addition, to obtain higher strength and considering ease of manufacture in the case above, holder (17) was made of metal and see-through window (173) was furnished, so the inside of cylinder part (S) is visible. And in this case, mounting holes are furnished directly in holder (17) and so that it can be mounted and affixed, so it can be mounted securely and stably. Furthermore, there is no danger that cylinder main body (11) will be subjected to bending stress during mounting.

On top of that, if tightening of holder (17) is adjusted appropriately, the pressing force will be adjusted according to the range of pressure in the fluid used and the range of temperature change, and the airtightness can be [maintained] at the optimal condition.

The present invention is not in any way limited to only the application example discussed above and shown in the figures. It can be realized with many variations within a range that will not change its essential points.

For example, with the aforementioned application example, cap (13) is constructed with polyethylene tetrafluoride resin or the like, the tip of cylinder main body (11) is sealed by O-ring (14), and changes in volume caused by temperature will be absorbed by the elasticity of O-ring (14). But cap (13) could be constructed with an elastic material, such as fluorine rubber, ethylene rubber, etc. and the tip of cylinder main body (11) could be sealed and changes in volume absorbed by it without using O-ring (14). Annular member (16) could also be constructed with an elastic material as described above or urethane rubber, etc. so that the same effects are obtained.

When O-ring (14) is furnished, the location where the O-ring is inserted may be at any of the locations 14(A), 14(B), or 14(C) as shown in Figure 4, or at multiple locations.

Additionally, an elastic sheet (18) may be laid (it may be applied by coating with an elastic material) on the surface of first member (17b) of holder (17) that touches annular member (16) in place of O-ring (14).

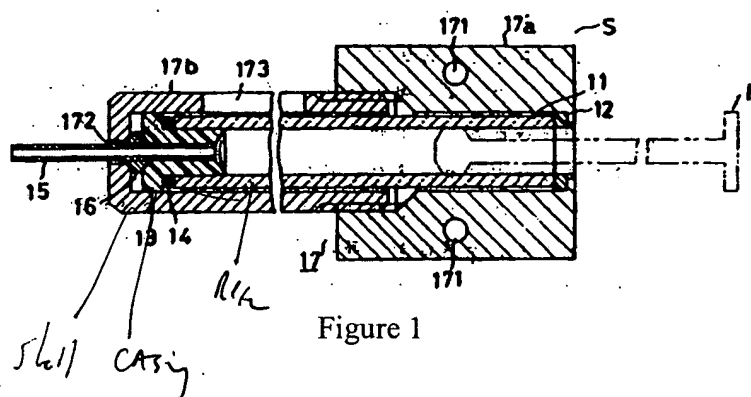
A spherically shaped annular member (19) with a through-hole could also be used as shown in Figure 6.

With this invention, as discussed in detail above, it is possible to provide a syringe that has no drop in precision in the cylinder part caused by changes in temperature, and further, that it does not break easily, and in which the relevant components can be easily replaced when any of them deteriorate.

Brief explanation of the figures

Figures 1 and 2 are a longitudinal cross section and an oblique view, respectively, showing the constitution of an application example of this invention. Figures 3-6 are each a different cross section of the major parts for explaining other application examples of this invention.

- 11 Cylinder main body
- 12 Packing
- 13 Cap
- 14 O-ring
- 15 Pipe
- 16, 19 Annular member
- 17 Holder
- 17a First member
- 17b Second member
- 171 Mounting hole
- 172 Hole part
- 173 See-through window
- 18 Elastic sheet



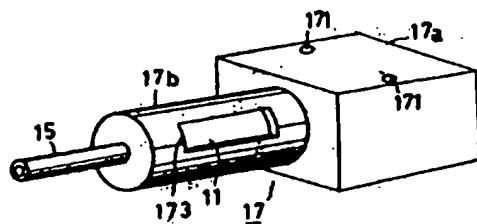


Figure 2

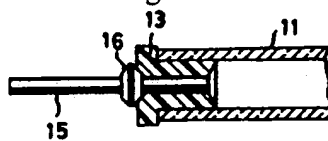


Figure 3

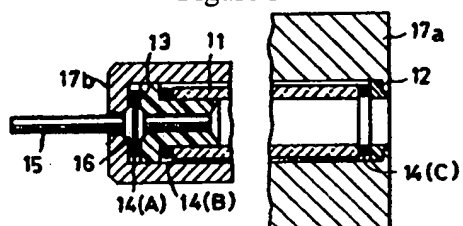


Figure 4

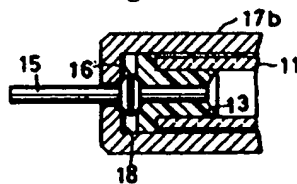


Figure 5



Figure 6

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